Introduction

Ground water contamination has been detected in an area of Ada County northwest of Eagle, Idaho. Monitoring data in the area (mostly from domestic wells) indicates that the shallow ground water zones (less that 150 feet deep) are impacted by nitrate and agricultural chemicals including dacthal, atrazine, 1,2-dichloropropane, and 1,2,3-trichloropropane. The project area is roughly two and one-half square miles in size. A majority of the study area is situated on permeable sand and gravel alluvial fan deposits. The specific source(s) of the ground water impacts has not been determined although the presence of agricultural pesticides indicates an impact from agricultural practices. Other potential contributors to ground water contamination in the area include septic systems, residential use of chemicals, a feedlot, and a municipal wastewater rapid infiltration treatment system. Figure 1, page 2, shows the areas of known nitrate and dacthal impacts.

Purpose and Objectives

The purpose of this study was to collect ground water quality information from domestic wells that had not previously been sampled by a resource agency. Several other domestic wells in the area have been sampled previously by DEQ, ISDA, and the Idaho Department of Water Resources (IDWR).

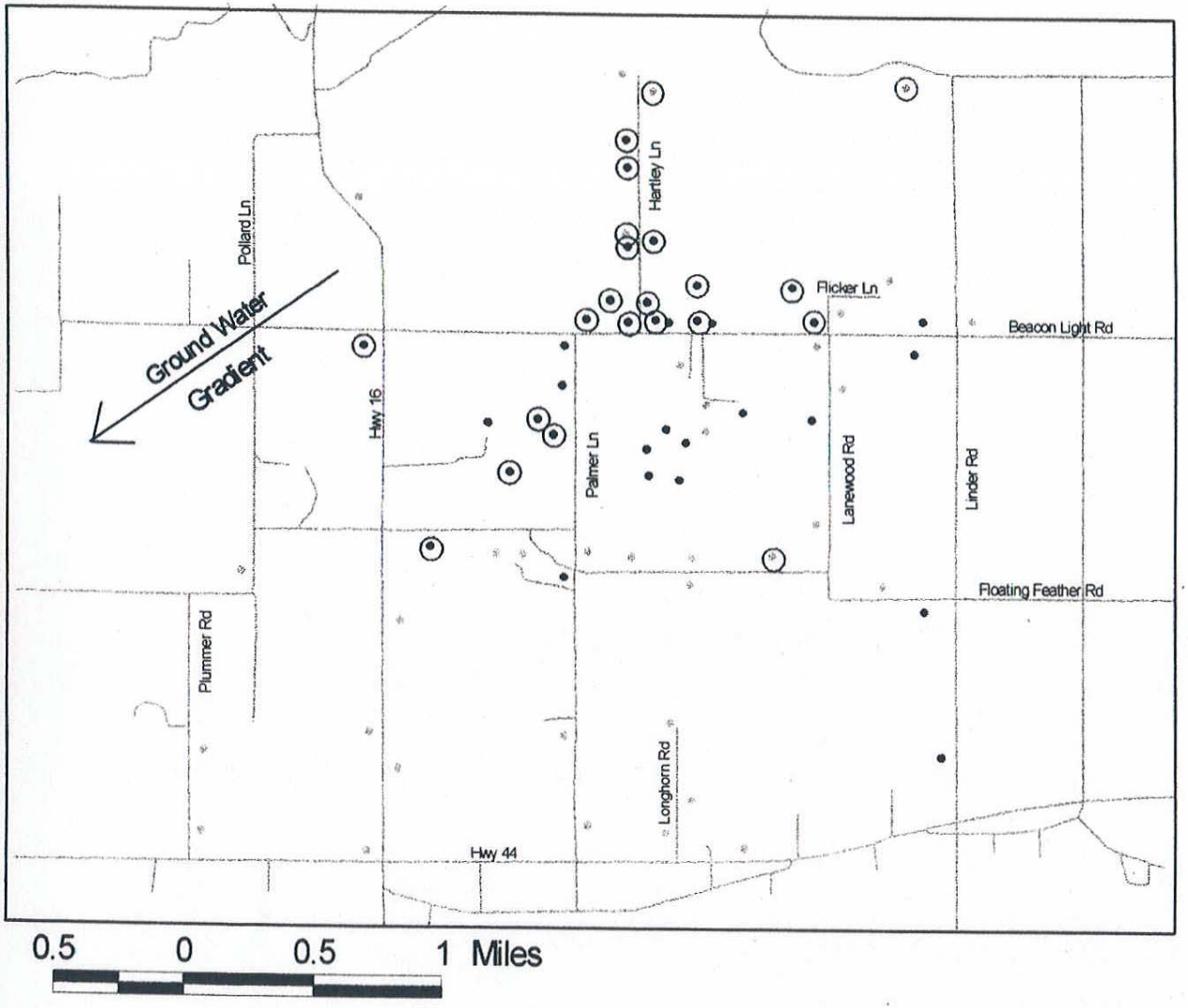
The objectives of this study were to use the data to evaluate the horizontal extent of the impacted area and to provide a basis for issuing health warnings or advisories to affected well owners. Data will also be used to determine the need for alternative water supplies for the affected residences.

Literature Review

DEQ conducted a nitrate study of the area in April 1990. This study area of approximately seven square miles showed a large range of nitrate results, from non-detect (<0.05 mg/l) to 62 mg/l. The well depths varied from 69 feet to 300 feet (with known well depths).

In July 1991, IDWR's Statewide Ground Water Quality Monitoring program sampled a well near the corner of Beacon Light Rd and Linder Rd that had volatile organic compounds (VOCs). The VOCs detected were 1,2-dichloropropane and 1,2,3-trichloropropane. As a follow up to these detections, DEQ sampled an adjacent well and 1,2-dichloropropane was detected.

These constituents were recognized by ISDA as compounds that are present in some pesticides. In December 1991, ISDA conducted a phase I study which sampled eight wells in the area for on-site measurements of temperature, pH, specific conductance and nitrate. In February 1992 these



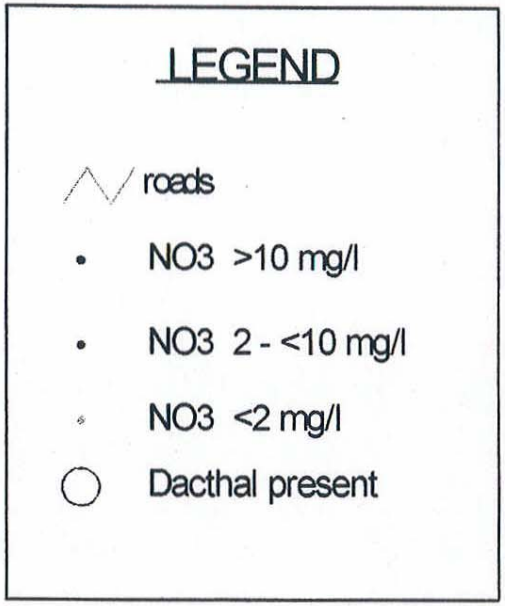


Figure 1. NW Ada County Nitrate (NO3) and Dacthal Results

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eight wells were re-sampled and the laboratory analyses detected 1,2-dichloropropane in two of the wells. A phase II study was conducted to determine the extent of the contamination. Ten additional wells were sampled in June 1992, for the phase II study, where 1,2-dichloropropane and 1,2,3-trichloropropane were detected in four of these wells. There were two recommendations from this study: 1) wells completed in the upper most water bearing zones should be tested for 1,2-dichloropropane, 1,2,3-trichloropropane and nitrate, and 2) more stringent well drilling standards be installed for future wells in the area.

ISDA conducted another ground water study in 1995. This study concentrated on nitrate, pesticides, and VOCs. There were thirty-nine wells sampled for this study, eighteen which had pesticide detections with sixteen of the eighteen wells, also, having positive VOC detections.

Also in 1995, some wells in this area were sampled as part of a cooperative regional ground water study that was being conducted by DEQ and the U.S. Geological Survey. The wells in this area were the only ones in Ada and Canyon Counties where nitrate, Dacthal, 1,2-dichloropropane and 1,2,3-trichloropropane were all detected in the same wells.

Study Area

The study area is located in Northwest Ada County. The wells are located in Township 5 North, Range 1 West, sections 34 and 35, and Township 4 North, Range 1 West, sections 2-4. Roads that encompass this area are Linder Rd on the east, Floating Feather on the south, Hwy 16 on the west, and the foothills on the north. Figure 1, page 2, shows these boundaries.

Climate

The valley has a semi-arid, temperate climate characterized by cool, wet winters and warm, dry summers (Dion 1972). The mean annual temperature is 51 degrees Fahrenheit. The mean annual winter and summer temperature is 33 degrees Fahrenheit and 71 degrees Fahrenheit, respectively. The mean annual precipitation is 11 inches; a majority of the precipitation falls during the winter as snow.

Soils

The soil survey of Ada County Area, Idaho (USDA Ada SCS, 1980) identifies two general soil map units in the area. The vast majority of the area consists of the Notus-Moulton-Falk map unit which occurs on flood plains, low terraces, and drainageways. The soils in this map unit are nearly level to sloping, poorly drained to well drained and very deep.

A small area in the northern portion of the study area consists of the Cashmere-Tindahay map

unit. This unit occurs on lacustrine foothills. The soils in this unit are nearly level to steep, well drained to somewhat excessively drained and very deep.

Geology and Hydrogeology

Driller's reports indicate that the hydrogeology of the area consists of an upper and lower water bearing zone composed of alternating layers of clay and sand, separated by a thick clay layer. Such a stratigraphic sequence is indicative of fluvial deposition. A review of the geology and geomorphology in the Boise Valley, by Kurt Othberg (1994), describes the area as sandy alluvium of side-stream valleys and gulches to sand of incised alluvial fans.

The ground water in the uppermost layer of the upper water bearing zone occurs under water table conditions and is encountered at depths ranging from 5 to 20 feet. This upper layer consists of a thick sequence of clayey sand, sand and gravel which is underlain by a 10 to 20 foot thick clay layer. Wells in the area range in depth from 60 to 300 feet. Most are less than 150 feet deep and pump ground water from the upper water bearing zone. A significant potential of ground water recharge in the upper water bearing zone would be from the intricate network of irrigation ditches and canals.

The direction of ground water flow in the upper water bearing zone is to the southwest, towards the Boise River (Thomas and Dion, 1974). The direction of ground water flow in the lower water bearing zone is unknown, but surmised to be similar to the upper water bearing zone. Aquifer pump tests conducted by the Eagle Sewer District in Township 4 North, Range 1 West, section 3 yielded hydraulic conductivities in the upper water bearing zone to range from 250 to 550 ft/day.

Land Use

The study area is predominately rural. The residents own acreage that they farm and/or raise livestock. They are reliant upon their own wells for their domestic water use and individual septic systems for their household wastewater. They have access to surface water for flood or sprinkler irrigation.

There are a few businesses located in the study area. There is a large commercial stockyard that has a history of wasterwater management problems. South of this stockyard is where the Eagle Sewer District has their rapid infiltration basins. Also in the area, is a family owned dairy and hog farm. Figure 2, page 5, shows the location of the businesses in the area.

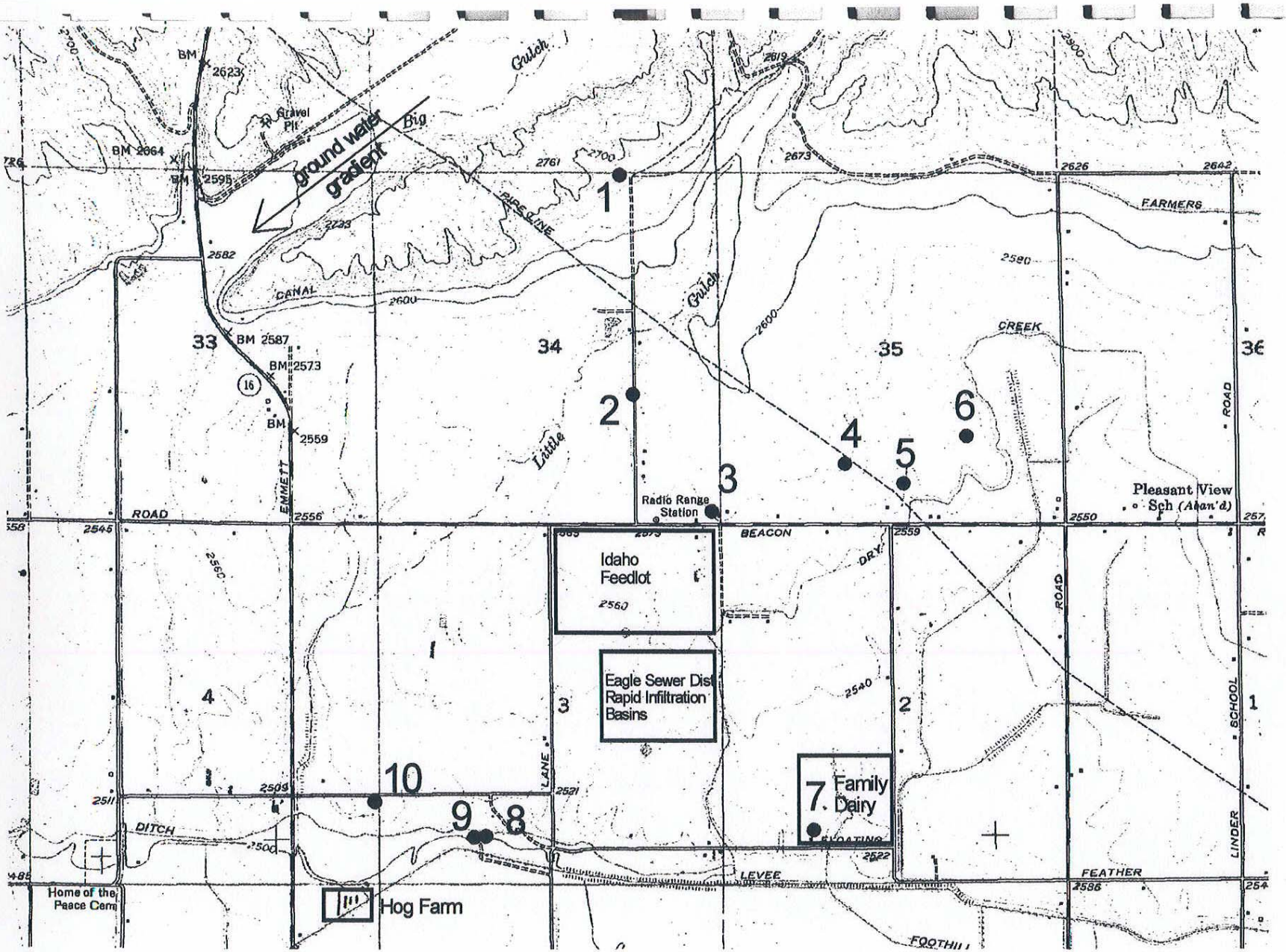

Figure 2. Location of Current Businesses*

*these businesses are surrounded by agricultural crop production

Methods and Materials

Nine of the ten wells were sampled during two consecutive days on March 11 and 12, 1997, the tenth well had be sampled three weeks earlier on February 20, 1997 for the well owners convenience. One duplicate ground water sample and one trip blank for each day of sampling was collected as quality control measures for each sampling event. Every well was tested for total coliform and fecal coliform. The nutrients which were analyzed at each well included ammonia, nitrate, total Kjeldahl nitrogen, and total phosphorus. Chloride was, also, analyzed at every well. The sampling parameters for VOCs and pesticides are listed in Table 1, below, and Table 2, page 7, respectively. Ground water sampling procedures and quality assurance/quality control can be found in appendix A and B, pages 16-19.

Table 1. List of VOCs analyzed by the State of Idaho Bureau of Laboratories.

Method: EPA 502.2/8021

Benzene	1,2-Dichlorobenzene	Methylene chloride
Bromobenzene	1,3-Dichlorobenzene	Naphthalene
Bromochloromethane	1,4-Dichlorobenzene	n-Propylbenzene
Bromodichloromethane	Dichlorodifluoromethane	Styrene
Bromoform	1,1-Dichloroethane	1,1,1,2-Tetrachloroethane
Bromomethane	1,2-Dichloroethane	1,1,2,2-Tetrachloroethane
n-Butylbenzene	1,1-Dichloroethene	Tetrachloroethene
sec-Butylbenzene	cis-1,2-Dichloroethene	Toluene
tert-Butlybenzene	trans-1,2-Dichloroethene	1,2,3-Trichlorobenzene
Carbon Tetrachloride	1,2-Dichloropropane	1,2,4-Trichlorobenzene
Chlorobenzene	1,3-Dichloropropane	1,1,1-Trichloroethane
Chloroethane	2,2-Dichloropropane	1,1,2-Trichloroethane
Chloroform	1,1-Dichloropropene	Trichloroethene
Chloromethane	cis-1,3-Dichloropropene	Trichlorofluoromethane
2-Chlorotoluene	trans-1,3-Dichloropropene	1,2,3-Trichloropropane
4-Chlorotoluene	Ethylbenzene	1,2,4-Trimethylbenzene
Dibromochloromethane	Hexachlorobutadiene	1,3,5-Trimethylbenzene
1,2-Dibromoethane	Isopropylbenzene	Vinly Chloride
1,2-Dibromomethane	p-Isopropyltoluene	Xylenes (total)

1,2-Dibromo-3-chloropropane

Table 2. List of pesticides analyzed by the University of Idaho Laboratory.

Method 515.1

Acifluorfen	MCPA	4-Nitrophenol
Bentazon	Dicamba	Pentachlorophenol
Chloramben	3,5-Dichloroben. Acid	Picloram
2,4-D	Dichloroprop	2,4,5-T
Dalapon	Dinoseb	2,4,5-TP
2,4-DB	Dacthal (DCPA)	

Method: EPA 507

Alachlor	Ethoprop	Prometon
Ametryn	Fenamiphos	Prometryn
Atraton	Fenarimol	Pronamide
Atrazine	Hexazinone	Propazine
Bromacil	Merphos	Simazine
Butachlor	Methyl Paraoxon	Simetryn
Butylate	Metolachlor	Stirofos
Carboxin	Metribuzen	Tebuthiuron
Chlorpropham	Mevinphos	Terbacil
Cycloate	MGK-264	Terbufos
Diazinon	Molinate	Terbutryn
Dichlorvos	Napropamide	Triademefon
Diphenamid	Norflurazon	Tricyclazole
Disulfoton	Pebulate	Vernolate
EPTC		

Method: Non-Reg Ops + LDL

Azinphos Methyl	Cyanazine	Methyl Parathion
Benefluralin	Ethalflualin	Parathion
Benthiocarb	Fonofos	Pendemethalin
Chlorpyrifos	Malathion	Triallate